Nonparametric Spatial-Temporal Modelling of the Association Between Ambient Air Pollution and Adverse Pregnancy Outcomes

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Abstract

Exposure to high levels of air pollution during the pregnancy is associated with increased probability of birth defects, a major cause of infant morbidity and mortality. New statistical methodology is required to specifically determine when a particular pollutant impacts the pregnancy outcome, to determine the role of different pollutants, and to characterize the spatial variability in these results.

We introduce a new methodology for high dimensional environmental-health data. More specifically, we present a Bayesian spatial-temporal hierarchical multivariate probit regression model that identifies weeks during the first trimester of pregnancy which are impactful in terms of cardiac congenital anomaly development. The model is able to consider multiple pollutants and a multivariate cardiac anomaly grouping outcome jointly while allowing the critical windows to vary in a continuous manner across time and space. We utilize a dataset of numerical chemical model output which contains information regarding multiple species of particulate matter. Our introduction of an innovative spatial-temporal nonparametric prior distribution for the pollution risk effects allows for greater flexibility to identify critical weeks during pregnancy which are missed when more standard models are applied. We apply these methods to geocoded pregnancy outcomes in Texas.

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Room W2008 (Refreshments 12:00pm)

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